FIG.1

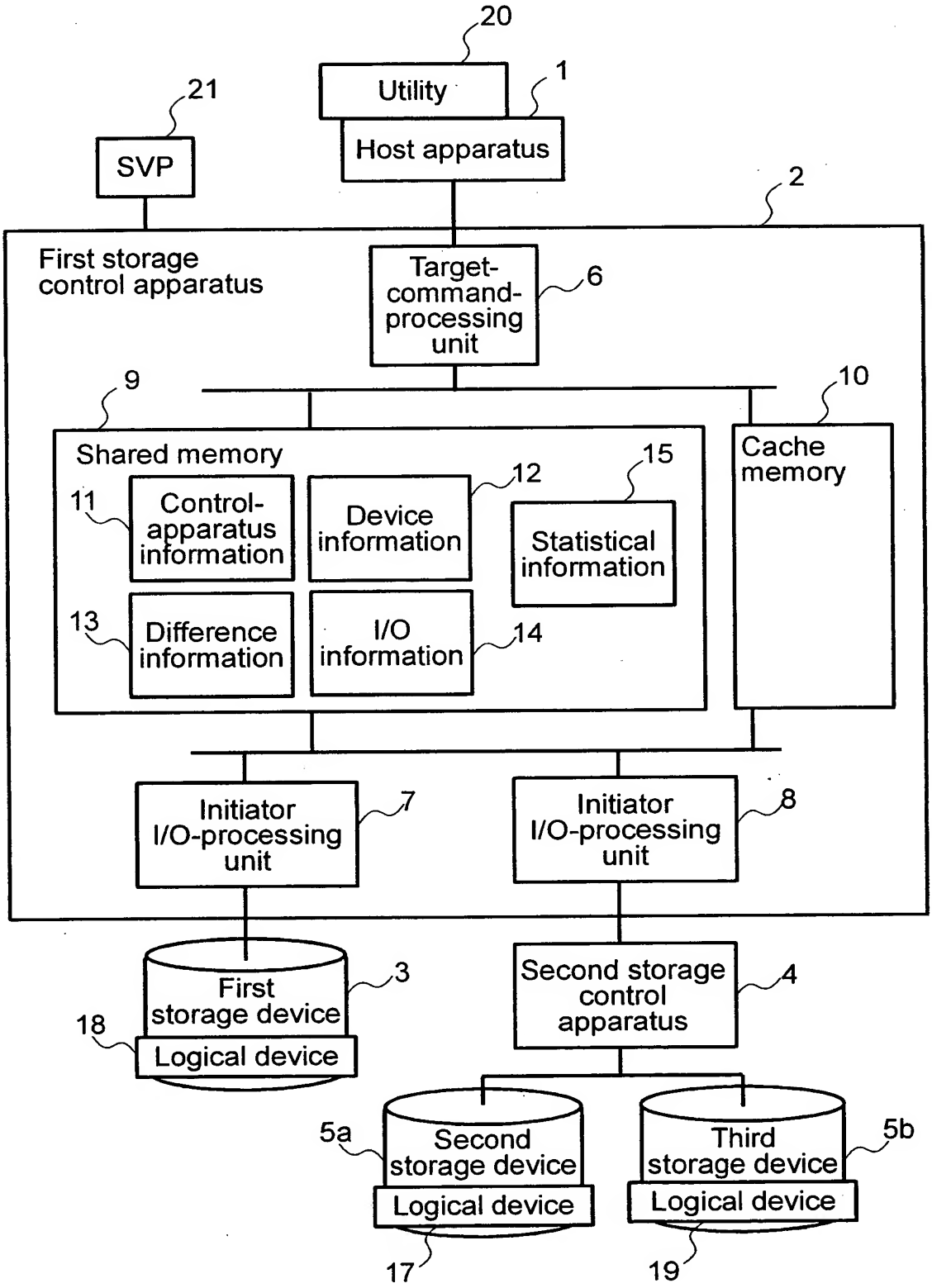

20
Utility
1
21
SVP
Host apparatus
2
First storage control apparatus
Target-command-processing unit
6
9
10
Shared memory
Cache memory
15
12
11
Control-apparatus information
Device information
Statistical information
13
Difference information
I/O information
14
Initiator I/O-processing unit
7
Initiator I/O-processing unit
8
First storage device
3
Second storage control apparatus
4
18
Logical device
5a
Second storage device
Third storage device
5b
Logical device
Logical device
17
19

FIG.2

101 Control-apparatus number	102 Case location	103 Initiator control unit number	104 Node Name	105 Address
0	Self	0	HTC	0000E8
1	Other	1	SBC	0100E4
2	Not applicable	Not applicable	Not applicable	Not applicable
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.

FIG.3

201 Logical-device number	202 Control-appratus number	203 Storage-device number	204 Pair state	205 Pair number	206 Attribute	207 Pair logical device number	208 Copy pointer
0	0	0	Split	0	Primary	1	Not applicable
1	1	0	Split	0	Auxiliary	0	Not applicable
2	1	1	Simplex	Not applicable	Primary	Not applicable	Not applicable
3	Not applicable	Not applicable	Simplex	Not applicable	Primary	Not applicable	Not applicable
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.

FIG.4

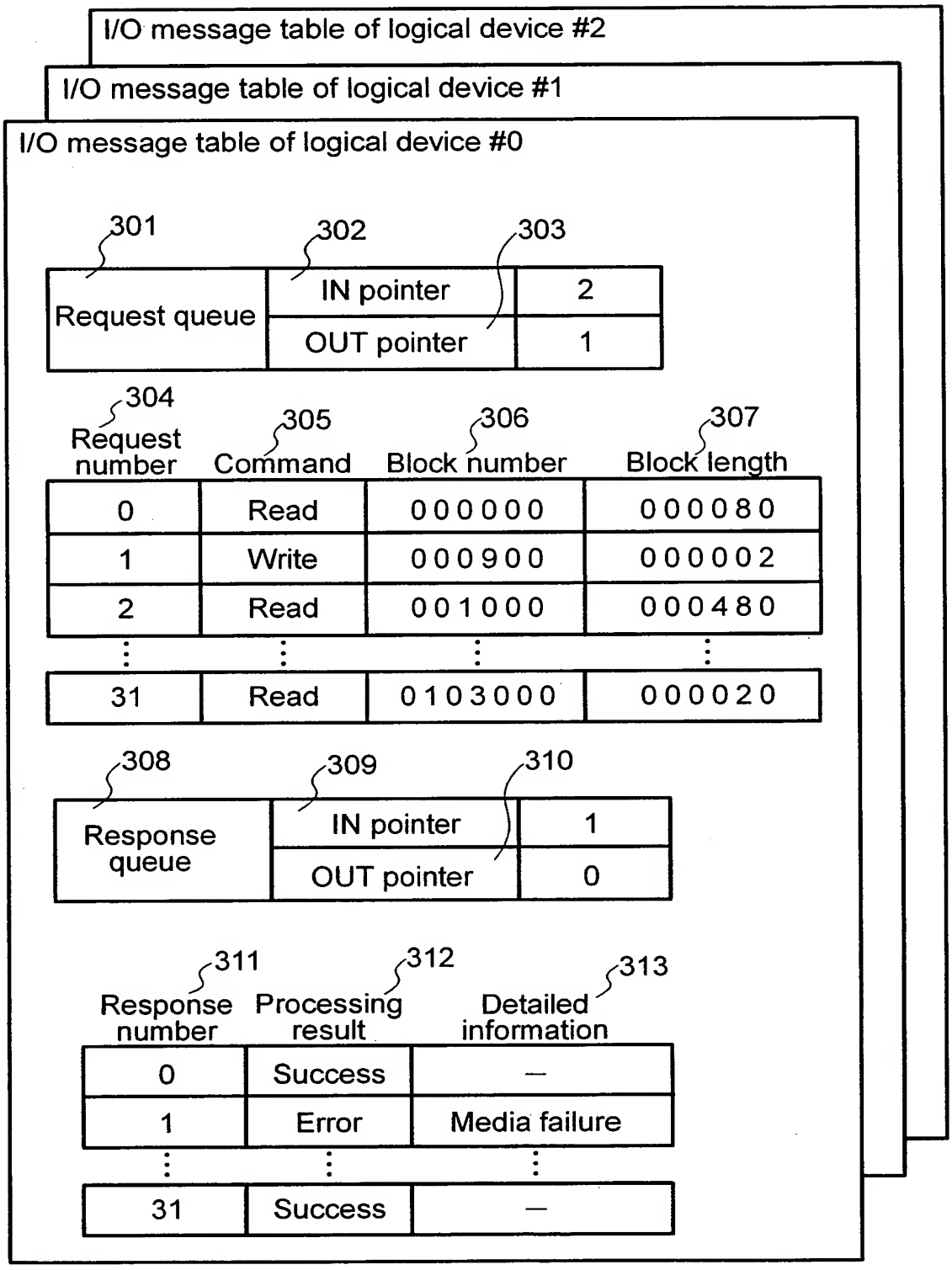

I/O message table of logical device #2
I/O message table of logical device #1
I/O message table of logical device #0
301
302
303
Request queue
IN pointer
2
OUT pointer
1
304
Request number
305
Command
306
Block number
307
Block length
0 Read 000000 000080
1 Write 000900 000002
2 Read 001000 000480
31 Read 0103000 000020
308
309
310
Response queue
IN pointer
1
OUT pointer
0
311
Response number
312
Processing result
313
Detailed information
0 Success —
1 Error Media failure
31 Success —

FIG.5

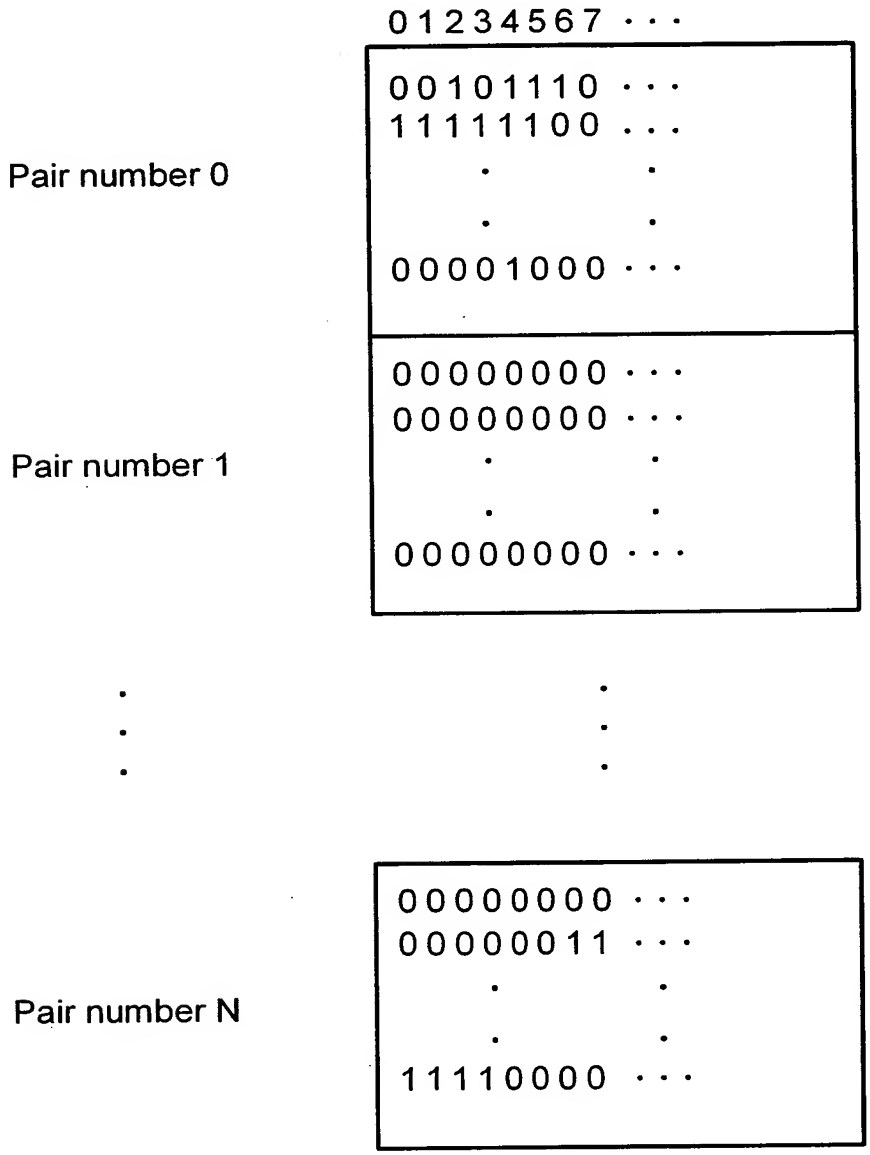

01234567 ···
00101110 ···
11111100 ···
00001000 ···
Pair number 0
00000000 ···
00000000 ···
00000000 ···
Pair number 1
00000000 ···
00000011 ···
11110000 ···
Pair number N

FIG.6

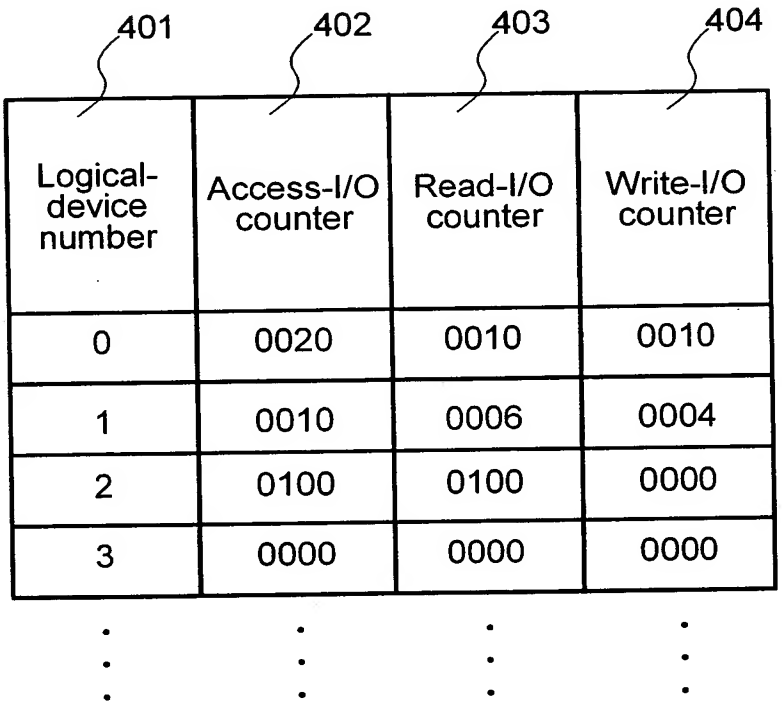

401
402
403
404
Logical-device number
Access-I/O counter
Read-I/O counter
Write-I/O counter
0
0020
0010
0010
1
0010
0006
0004
2
0100
0100
0000
3
0000
0000
0000

FIG.7

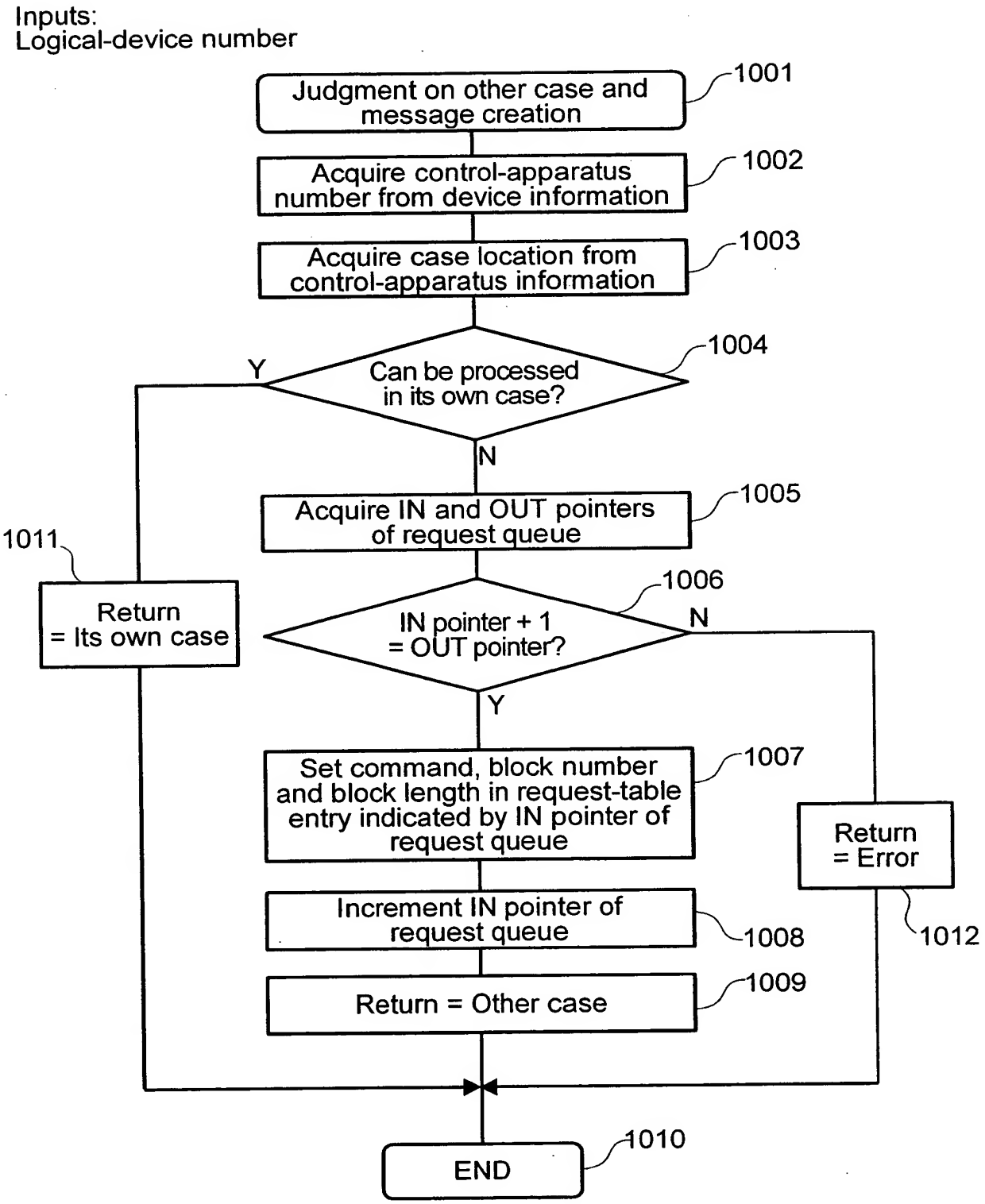

Inputs:
Logical-device number
Judgment on other case and message creation
1001
Acquire control-apparatus number from device information
1002
Acquire case location from control-apparatus information
1003
Can be processed in its own case?
1004
Y
N
Acquire IN and OUT pointers of request queue
1005
1011
Return = Its own case
IN pointer + 1 = OUT pointer?
1006
N
Y
Set command, block number and block length in request-table entry indicated by IN pointer of request queue
1007
Return = Error
1012
Increment IN pointer of request queue
1008
Return = Other case
1009
END
1010

FIG.8

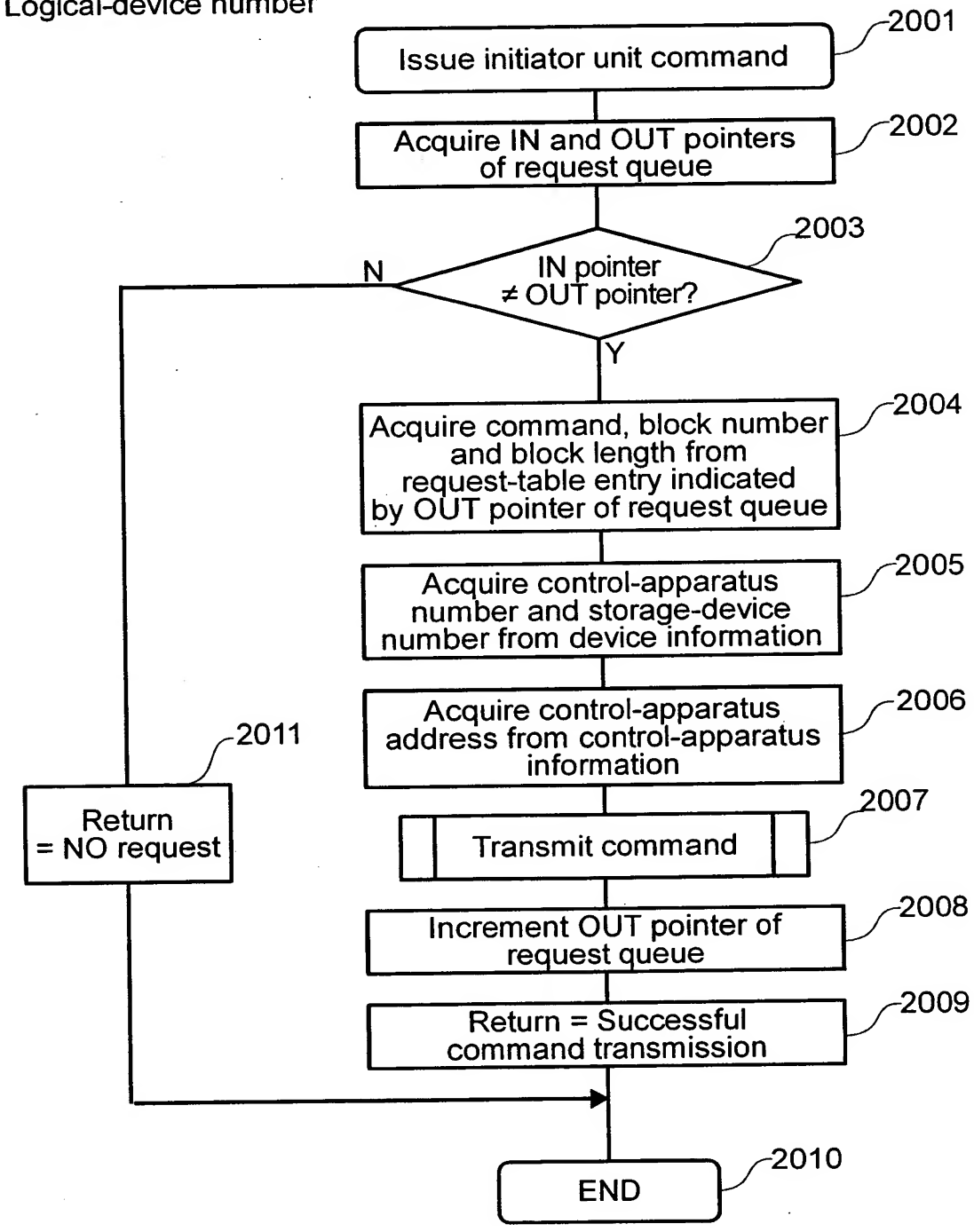

Inputs:
Logical-device number
Issue initiator unit command
2001
Acquire IN and OUT pointers of request queue
2002
IN pointer ≠ OUT pointer?
2003
N
Y
Acquire command, block number and block length from request-table entry indicated by OUT pointer of request queue
2004
Acquire control-apparatus number and storage-device number from device information
2005
Acquire control-apparatus address from control-apparatus information
2006
Transmit command
2007
Increment OUT pointer of request queue
2008
Return = Successful command transmission
2009
Return = NO request
2011
END
2010

FIG.9

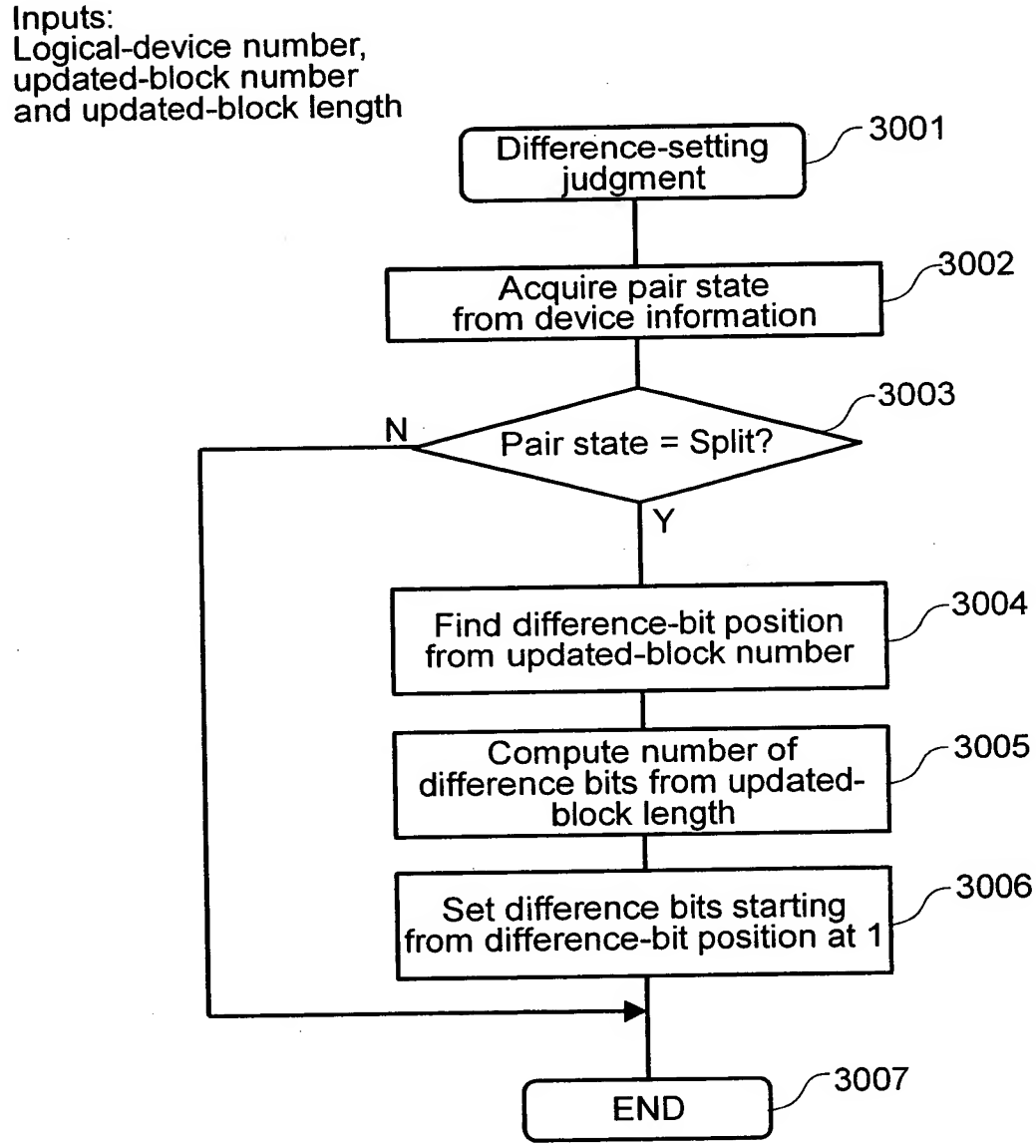

Inputs:
Logical-device number,
updated-block number
and updated-block length
Difference-setting judgment
3001
Acquire pair state from device information
3002
Pair state = Split?
3003
N
Y
Find difference-bit position from updated-block number
3004
Compute number of difference bits from updated-block length
3005
Set difference bits starting from difference-bit position at 1
3006
END
3007

FIG.10

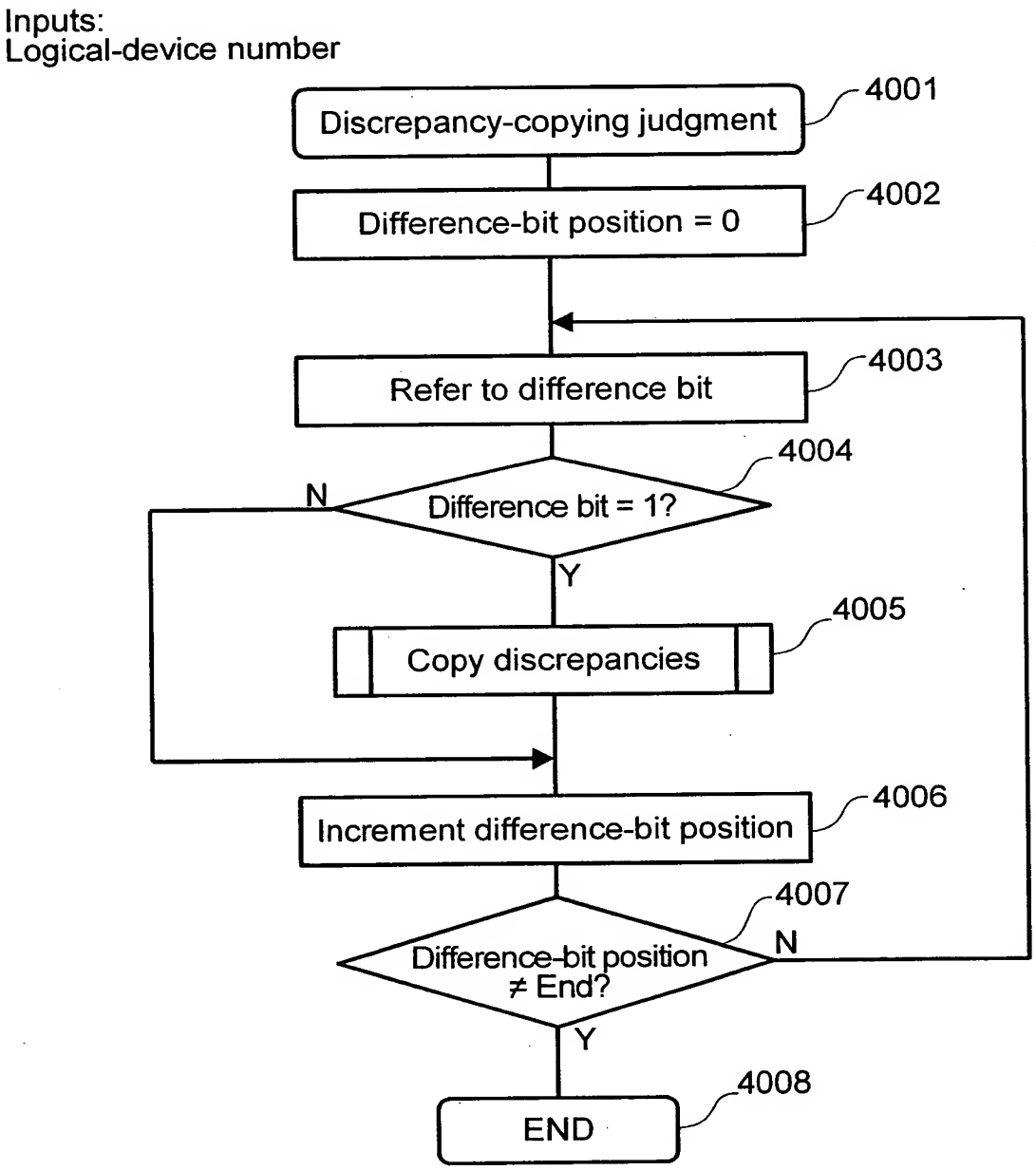

Inputs:
Logical-device number
Discrepancy-copying judgment
4001
Difference-bit position = 0
4002
Refer to difference bit
4003
Difference bit = 1?
4004
N
Y
Copy discrepancies
4005
Increment difference-bit position
4006
Difference-bit position ≠ End?
4007
N
Y
END
4008

FIG.11

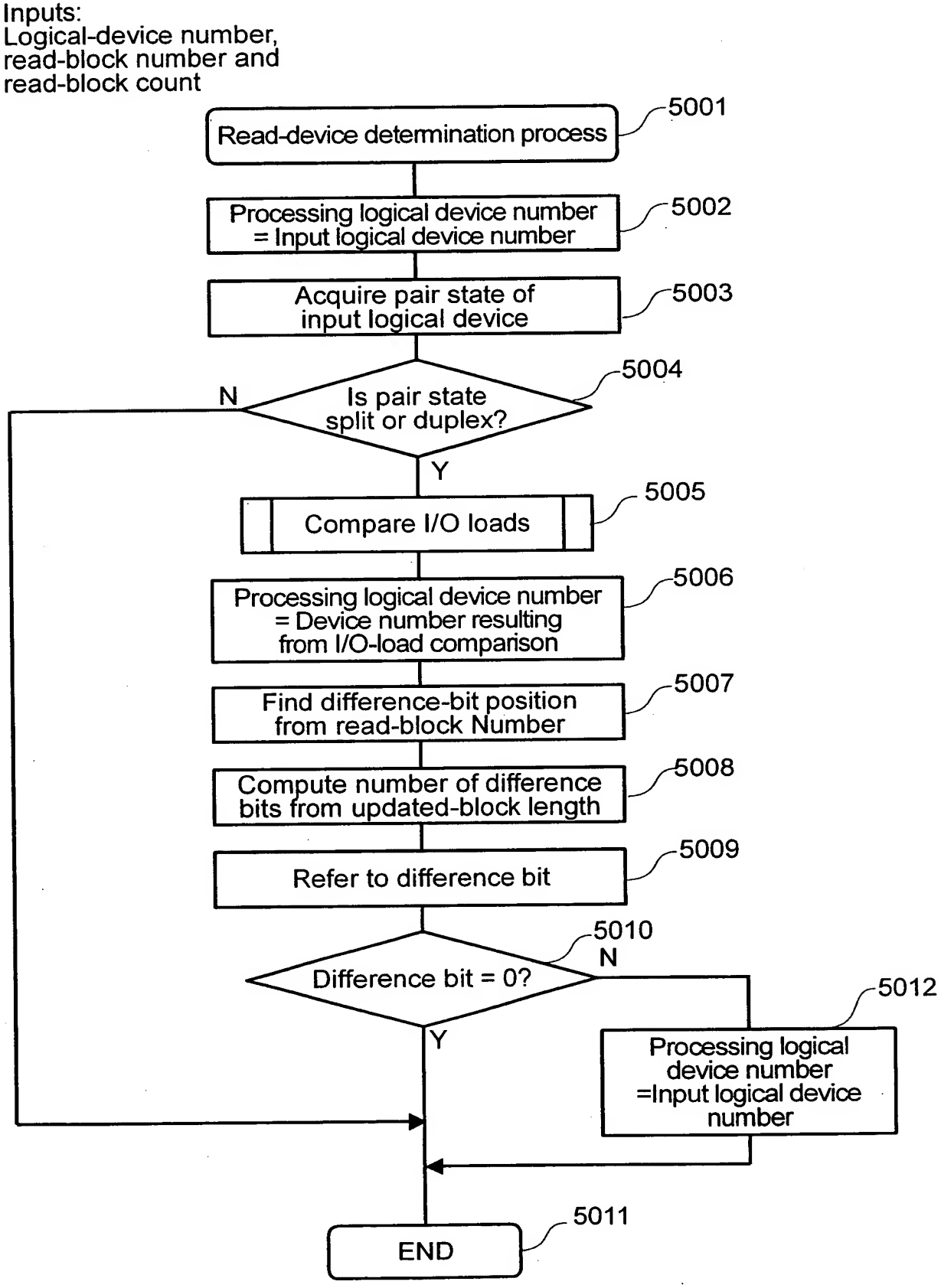

Inputs:
Logical-device number,
read-block number and
read-block count
Read-device determination process
5001
Processing logical device number = Input logical device number
5002
Acquire pair state of input logical device
5003
Is pair state split or duplex?
5004
N
Y
Compare I/O loads
5005
Processing logical device number = Device number resulting from I/O-load comparison
5006
Find difference-bit position from read-block Number
5007
Compute number of difference bits from updated-block length
5008
Refer to difference bit
5009
Difference bit = 0?
5010
N
Y
Processing logical device number =Input logical device number
5012
END
5011

FIG.12

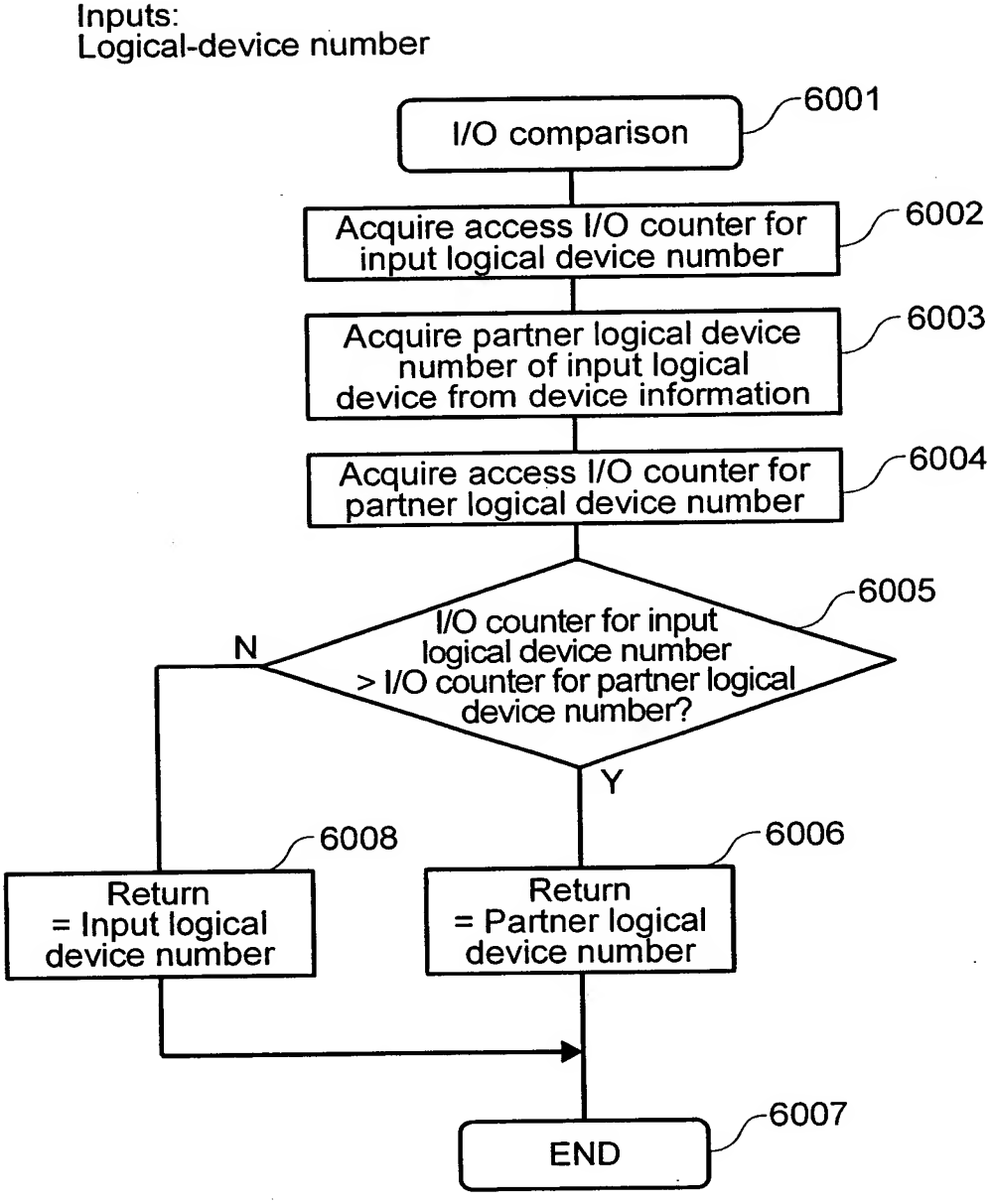

Inputs:
Logical-device number
I/O comparison
6001
Acquire access I/O counter for input logical device number
6002
Acquire partner logical device number of input logical device from device information
6003
Acquire access I/O counter for partner logical device number
6004
I/O counter for input logical device number > I/O counter for partner logical device number?
6005
N
Y
Return = Input logical device number
6008
Return = Partner logical device number
6006
END
6007

FIG.13

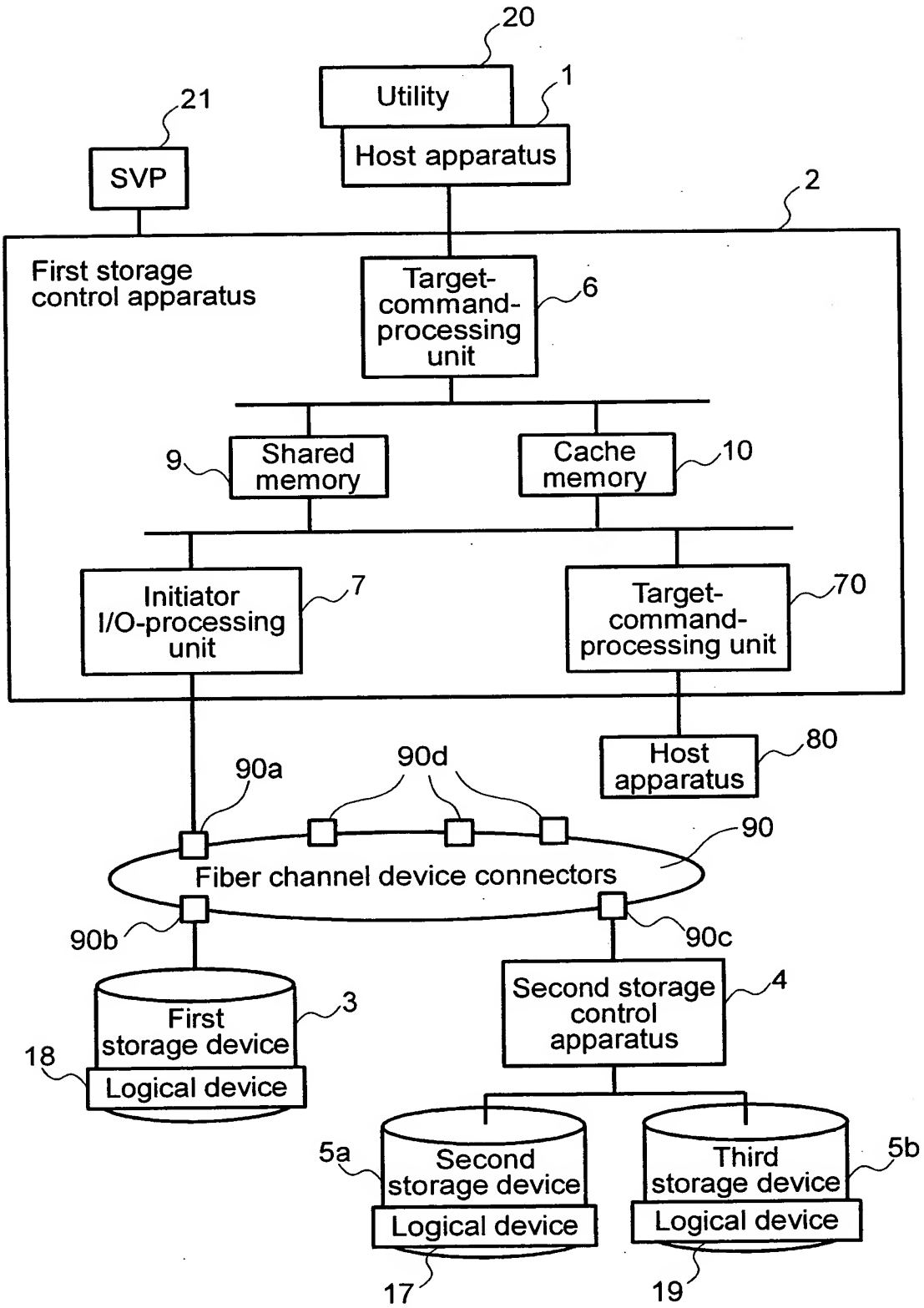
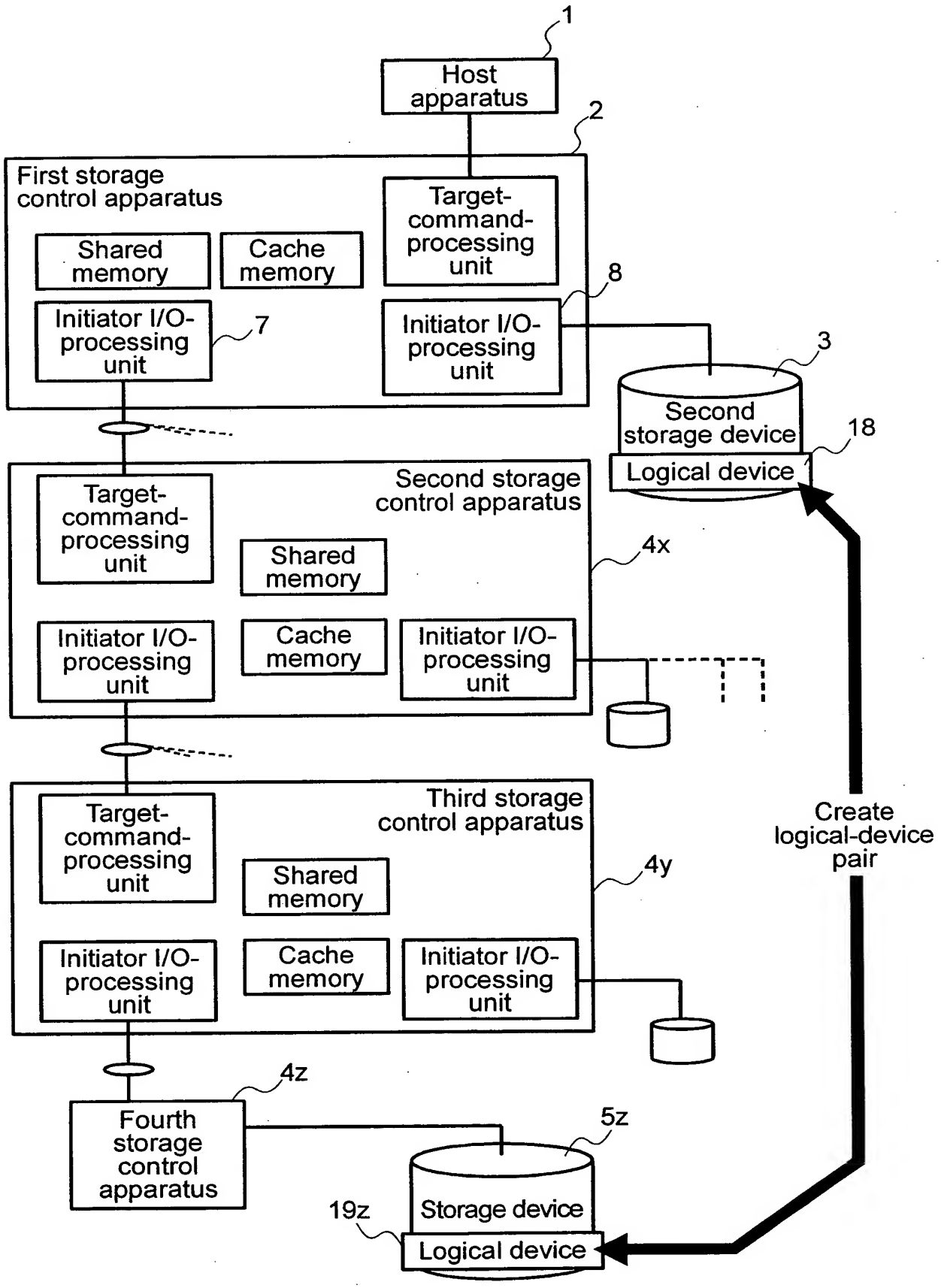

20
Utility
1
21
SVP
Host apparatus
2
First storage control apparatus
Target-command-processing unit
6
9
Shared memory
Cache memory
10
Initiator I/O-processing unit
7
Target-command-processing unit
70
Host apparatus
80
90a
90d
90
Fiber channel device connectors
90b
90c
First storage device
3
18
Logical device
Second storage control apparatus
4
5a
Second storage device
Logical device
Third storage device
5b
Logical device
17
19

FIG.14

101 Control-apparatus number	102 Case location	103 Initiator control unit number	104 Node name	105 Address
0	Self	0	HTC	0000E8
1	Other	0	SBC	0000E4
2	Not applicable	Not applicable	Not applicable	Not applicable
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.

FIG.15


1
Host apparatus
2
First storage control apparatus
Shared memory
Cache memory
Target-command-processing unit
8
Initiator I/O-processing unit
7
Initiator I/O-processing unit
3
Second storage device
18
Logical device
Second storage control apparatus
Target-command-processing unit
Shared memory
4x
Initiator I/O-processing unit
Cache memory
Initiator I/O-processing unit
Third storage control apparatus
Target-command-processing unit
Shared memory
4y
Initiator I/O-processing unit
Cache memory
Initiator I/O-processing unit
Create logical-device pair
4z
Fourth storage control apparatus
5z
Storage device
19z
Logical device